Remotely Sensed Temporal Land Use Data for the

Robert C. Lozar
Engineering Research and Development Center, Champaign IL; Robert.C.Lozar@erdc.usace.army.m
Charles R. Ehlschlaeger
Department of Geography, Hunter College (CUNY), New York NY; chuck@geo.hunter.cuny.edu
Harold Balbach
Engineering Research and Development Center, Champaign IL; Hal.E.Balbach@erdc.usace.army.mil

Abstract:

One goal of SEMP is technology transfer from the Ft. Benning site to other installations and managed landscapes in shared ecoregions. This project's focus is the Fall Line Sandhills region that stretches across Georgia into the Carolinas, just coastward of the Piedmont. With support from both the Army and SERDP, a major data set is being refined and made available to SEMP cooperators. Hunter College staff have developed a unique software algorithm to identify historical land use changes using the North American Land Characterization (NALC) and Multi-Resolution Land Classification (MRLC) data. Hunter has begun to refine these algorithms to target specific land use categories of interest to military land management questions. The purpose of the data is to set a standard for monitoring land use changes over a long time horizon.

The data for the Sandhills (with buffer) includes:

National Land Cover Data Generated Land Cover data for the:
- 1970's
- 1980's
- 1990's

Contextual data
Metadata descriptions

Background:

The U.S. Department of Defense is committed to proactive ecosystem management of military lands and waterways. All of the DOD services have expressed the need for better understanding of ecological processes and trends on military lands, the ecological relationship of military lands to their surrounding lands, and the interactions between mission activities and ecological processes. In response to these expressed needs, the Strategic Environmental Research and Development Program (SERDP) sponsored a workshop in 1997 to explore the critical knowledge gaps in understanding ecosystem wide status, especially as they relate to military land management concerns.

Longleaf Pine Forest in the Sandhills Ecosystem. This is the desired state of the land for many people.

SERDP THEMES

The primary themes that emerged from the Workshop included:
1) Ecosystem Health or Change Indicators,
2) Thresholds of Disturbance,
3) Biogeochemical Cycles and Processes, and
4) Ecosystem Processes as they relate to multiple temporal and spatial scales. After this workshop, the SERDP Ecosystem Management Project (SEMP) was created as a new SERDP project to pursue ecosystem research relevant to DOD ecosystem management concerns (including the research themes from the 1997 SERDP Workshop).

SEMP Objectives include:

- Addressing DOD requirements and opportunities in ecosystem management research,
- Establishing and managing one (or more) long-term ecosystem monitoring sites on DOD facilities for DOD relevant ecosystems research,
- Conducting multiple ecosystem research and monitoring efforts, relevant to DOD requirements and opportunities, at these and/or additional facilities, and
- Facilitating the integration of results and findings of research into DOD ecosystem management practices.

Rowan Hill – an area in transition. Former agricultural land used for military training. The Sandhills data will provide and objective base for monitoring long term changes in landscape units like this.

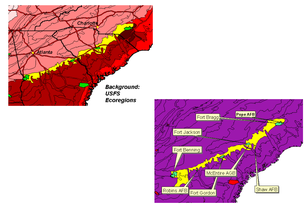
The Ecoregion Systems Heritage & Encroachment Monitoring (ESHEM) Initiative:

- This ESHEM work is the initial attempt to examine issues of change and land management at an ecosystem level.
- Recent technological advances have made this feasible only within the last few years
- It is expected that cooperation with other land managers will become part of the process as this research matures.
- The Sandhills Initiative is the first and most advanced prototype.
- Ignoring realities beyond the "fence-line" is an invitation to land use conflicts.

Why?

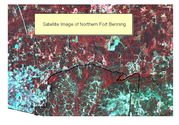
- Mission Sustainability and Encroachment are big issues in the military because
  - habitat and development have the potential to effect military training and readiness. And,
  - Federal Lands management must occur in cooperation with neighbors, political and local interest groups.

Sandhills Ecoregion Data Base Setting:



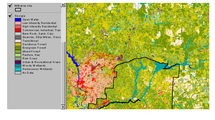
Historical Trend Data From Two Sources:

1. The North American Land Characterization (NALC) data sets
   - Provides Imagery data for the 1970s, 1980s, early 1990s, and DEM
   - Consistent Georeferenced data set
   - Provides Objective evaluation of Land cover (therefore Landscape Ecology) trends
2. The Multi-Resolution Land Characteristics (MLRC) data sets
   - Provides similar data for later 1990s
   - Coordinates with standard Land Cover Classes (National Land Characterization Data - NLCD)



Example NALC Source Imagery (MSS) - 1970

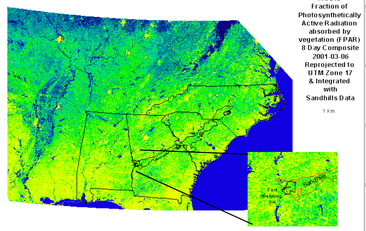
Example MLRC Land Cover Classes ~1990



Ecoregion Indices Monitoring

NASA's new Terra Satellite
- is beginning to collect a 15-year scientific data set. And,
- is intended to help scientists follow environmental change

For Sandhill research we are using the MODIS instrument.
- Regional scale
- Regular and frequent revisit rate.
- Products useful for landscape ecology:
  - Land Cover/Land Cover Change
  - Vegetation Indices
  - Thermal change
  - Leaf Area Index
  - Photosynthetically Active Radiation
  - Evapotranspiration
  - Net Primary Productivity
  - Gridded Vegetation Indices
  - Vegetation Cover Conversion


MODIS
Fraction of Photosynthetically Active Radiation absorbed by vegetation (FPAR) 8 Day Composite 2001-03-06
Reprojected to UTM Zone 17 & Integrated with Sandhills Data
1 km

Possible Applications For the Data:

- Potential Partnering
- Change Detection
- Encroachment Detection & Sustainability
- Ecoregion Health Monitoring
- Regional Characterizations
- Base Realignment and Closure (BRAC)
- Forestry Change Modeling

Potential Partnering

Federal Agencies represented are:
- Forest Service
- Fish & Wildlife Service
- National Parks Service
- DoD

Other Federal Lands (yellow) within Ecosystem and within Study Region